DISPENSER DEVICE

The present invention relates generally to materials handling and in particular to apparatus for dispensing materials in fine powder form, such as for example toner.

Known methods of dispensing materials in powdered form incorporate funnel-shaped devices, wide at their inlet and narrow at their outlet, and generally utilise gravity for dispensing material. However, fine powders in these systems can often form blockages and jam in the funnel, stopping material flow. Agitating means are used to unblock the funnel or prevent blockages, but require energy, labour, maintenance, and may be noisy and costly.

The present invention seeks to alleviate at least some of the abovementioned disadvantages.

According to one aspect of the present invention, there is provided a dispenser device including: a dispenser device body having an inlet end and an outlet end; a transport passage arranged therebetween, wherein the cross-sectional internal dimension at the inlet end of the transport passage are smaller than the cross-sectional internal dimension at the outlet end of the transport passage; at least two sealing connector sections, located at or near the inlet and outlet ends respectively, the device when in use being sealingly connectable with filler vessels and unfilled vessels respectively.

The arrangement is such that the sealable connection between said dispenser device and said unfilled vessel provides a substantially air tight seal so that air within the unfilled vessel is displaced by powder from the filler vessel, and passes through the transport passage during a filling operation. This provides for a significant advantage in that the air causes agitation of the material within the passage, reducing the chances of clogging and blockage.

The sealable connecting section may be any suitable shape, and may take

advantage of known sealing methods, including threaded portions, foam or rubber strips and light friction fits. It may also take the form of a flat or contoured plate, or indeed any shaped face which corresponds with another surface to reduce leakage of dust particles during dispensing from vessel to vessel. A plurality of sizes and shapes of seal may be incorporated on one apparatus, making one apparatus transferable across differing brands and styles of vessel, using a plurality of discrete sealing sizes, or tapered sections.

The transport passage may include rounded shoulders at its inlet end. In one form of the invention, the inner surface of the inner wall of the transport passage is preferably a continuous generally smooth tapered configuration, tapering outwardly from the inlet end towards the outlet end.

The contour formed by the inner wall of the transport passage may differ from the contour formed by the exterior wall of the transport passage. The exterior wall of the transport passage may be shaped to correspond to the inlet or access portion of the unfilled vessel, thereby incorporating the sealable connector portion.

The dispenser device body may be constructed from any suitable material, such as for example, any suitable polymer, machinable or mouldable in injection moulding processes, or from suitable metals or alloys. The device may include one or more parts, and may be constructed from one or more materials, for example, the sealing means as mentioned above, may be constructed from foam or rubber, operatively connected to other parts of the device.

Locating means may be provided for locating with a retaining portion on the unfilled vessel. In one form the locating means is in the form of one or more projections mounted on the external periphery of the dispenser device, which locates into or underneath a holding ledge, for maintaining sealing contact between dispenser device and the unfilled vessel.

Clips may be used to retain the device against the unfilled vessel. The clips may

engage the locating means and assist in maintaining sealing contact between dispenser device and unfilled vessel.

The filler vessel and unfilled vessel are preferably sealed, except for their respective filling outlet and filling inlet. This allows the air transferred from the unfilled vessel to the filler vessel during the filling operation to be contained within the vessels.

Preferred embodiments will now be described with reference to the accompanying drawings, and in those drawings:

Figure 1 shows section views (a), (c), and (e) and perspective views (b), (d) and (f) of three example embodiments according to the present invention.

Figure 2 shows section view (a), plan view (b) and perspective view (c) of another embodiment according to the present invention.

Figure 3 shows section view (a), plan view (b) and perspective view (c) of yet another embodiment according to the present invention.

Figure 4 shows plan view (a) and perspective view (b) of another example embodiment according to the present invention.

Figure 5 shows section view (a) and perspective view (b) of yet another embodiment of the present invention.

Figures 6 – 10 show examples of different ways that the dispenser devices may interrelate in order to transfer material from filling vessel to unfilled vessel.

Referring to Figures 1 - 5, like numerals have been used to describe like parts. Thus, referring to Figure 1, there is shown a dispensing apparatus generally indicated at 10, including an inlet end 14, an outlet end 16, an enclosed transport passage 12, an inlet

sealable connector section 18 and outlet sealable connector section 30.

Referring to Figures 1(a) and 1(b), in the form shown the transport passage 12 is a hollow cylinder. Its internal diameter at its inlet end 22 is smaller than the internal diameter at its outlet end 16, and the internal wall 24 forms an outwardly tapering tube. The sealable connector sections 18 and 30 take the form of threaded connections 20 (inlet) and 26 (outlet).

Referring to Figures 1(c) and 1(d), as stated above, like numerals denote like parts, however, some points of difference include: the outlet sealable connector section 130 does not include threaded connection as in Figure 1(a) and (b), but a push fit which includes protruding rings 126. A taper in the external wall 130 of the transport passage 112 at 128 allows location and sealing of the device in the opening of an unfilled vessel (not shown). The taper allows one or more opening sizes to be accommodated.

Referring to Figures 1(e) and 1(f) there is shown a similar embodiment to Figures 1(c) and (d), however, rather than a sealable connector section suitable for a small range of opening sizes, Figures 1(e) and (f) show an embodiment suitable for sealing three discrete opening sizes over a larger range. That is, external walls 230 of the transport passage 212 gradually accommodate for larger variations in aperture size in the unfilled vessel, where discrete increases in external diameter 228, 229 and 231 are formed into the shaft of the transport passage 212. From the inlet end of the interior wall of the transport passage the rounded shoulders 222 widen rapidly to point 225 and then the wall 224 of the transport passage 212 lightly outwardly tapers to the outlet.

Referring to Figure 2 there is shown an embodiment according to the present invention wherein the outlet sealable connector section 330 takes the form of a plate 332 with an arcuate section 335 to correspond with the inlet of a particular unfilled vessel (not shown). The plate 332 includes a foam adhered to its underside (not shown), substantially at its perimeter, to further improve the sealing effect of the plate 332. The transport passage 312 is essentially constant diameter throughout or lightly outwardly tapering,

assisting material flow. The inlet section 314 is sealed not with a threaded section as with previous example embodiments but with a simple push-fit system, incorporating essentially parallel internal walls at 320.

Retaining means are provided at 350 in the form of projections or lugs 351 and 352. These retaining means 350 engage with corresponding holding means (not shown) on the unfilled vessel (not shown).

Further retaining means 350 in the form of a drop-down plate section 353 is used in conjunction with clip (not shown) to hold the dispenser device against the unfilled vessel (not shown).

The embodiment shown in Figure 3 is similar to that shown in Figure 2 however there is no arcuate section, simply a plate shown at 432. Again, foam (not shown) improves the sealing qualities of the plate 432.

Similar retaining means as in Figure 2 are shown in Figure 3 at 450, and 453.

Referring to Figure 4 there is shown another example embodiment according to the present invention wherein the outlet sealable connector section 530 is located at the outer face of a triangular plate, corresponding to the inlet of an unfilled vessel (not shown). A very short transport passage 512 is employed, and the material quickly flows from the inlet side 514 to the outlet side 516 of the apparatus.

Referring to Figure 5 there is shown an embodiment similar to those shown in Figures 2 and 3, however the plate 632 is angled. Other aspects of the embodiment are the same as those shown in Figures 2 and 3, with like numerals denoting like parts.

The invention may operate singly or in combination with other example embodiments. For example, a filling vessel may be screwed into inlet end 114 or 214, of devices 110 and 210 respectively, and the outlet ends 116 and 216 thereof may be push-

fitted into the openings of unfilled vessels (not shown). Once the filling vessel is inverted, flow occurs. Agitation is not required during flow, however some small agitation may be required before inversion and flow occurs.

Other combinations may be made, for example, a filling vessel (not shown) may be screwed into the inlet end 214 of device 210. The outlet 216 of vessel 210 may then be push-fitted into inlet ends 314, 514, or 614. The corresponding outlet ends 316, 516, 616 are then sealably connected to the openings of unfilled vessels (not shown).

Still, other combinations may be made: for example, a filling vessel (not shown) may be screwed into the inlet end 114 of device 110. The outlet 116 of vessel 110 may then be push-fitted into inlet end 414. The corresponding outlet ends 416, are then sealably connected to the opening of unfilled vessel (not shown).

In further combinations, the outlet end of a filling vessel (not shown) may be screwed into the inlet end 14 of device 10. The outlet end 16 is then screwed into the inlet 114 or 214 of devices 110 or 210 respectively to form assemblies 650 (Figure 6(iv)) and 660 (Figure 6(v)).

The outlet end 116 and 216 of assembly 660 (Figure 6(v)) or 650 (Figure 6(iv)) may be push-fitted into an unfilled vessel (not shown).

Outlet end 116 of assembly 660 may be inserted, for example into: the inlet end 414 of device 410 to form dispenser assembly 680 (Figure 8).

Outlet end 216 of assembly 650 may be inserted, for example, into one of the following:

the inlet end 314 of device 310 to form dispenser assembly 690 (Figure 7);

the inlet end 514 of device 510 to form dispenser assembly 670 (Figure 9);

the inlet end 614 of device 610 to form dispenser assembly 700 (Figure 10).

To commence flow of material, the outlet sealable connector part (130, etc) of the dispenser devices 110, 210 or dispenser assemblies (660, etc) is sealingly connected to the inlet of an unfilled vessel (not shown) by pushing into (eg Figs 1(c) – 1(f), 6(iv), 6(v) and 9) or by placing against (eg Figs 7, 8 and 10). If they are not already, the apparatus and vessels are arranged such that the filling vessel (not shown) is generally vertically above the device (10, 110 etc) and the unfilled vessel (not shown). The filling vessel is inverted in this position, so that gravity may assist the downward flow of the powder through the mouth of the filling vessel, which is below its base. No agitation of the filling vessel is required during filling of the unfilled vessel, however, some minor agitation of the filling vessel may be required before attachment to a dispenser device (10, 110). The outwardly tapered or parallel cross-section of the interior of the transport passage (12, 112 etc) and seals between vessels and dispenser device allow air exchange from the unfilled vessel to the filling vessel. Thus, displaced air from the unfilled vessel bubbles through the powder and transport passage and into the filler vessel, agitating the powder. Blocking of the transport passage (12, 112, etc) with lumps of powder is therefore minimised, promoting free flow of the powder.

Finally, various alterations, modifications and/or additions may be incorporated into the various constructions and arrangements of parts without departing from the spirit or ambit of the invention.